

Remarks

The Office Action mailed December 1, 2005 has been carefully reviewed and the following remarks have been made in consequence thereof.

Claims 1, 2, and 4-26 are now pending in this application. Claims 1-26 are rejected. Claim 3 is canceled without prejudice, waiver, or disclaimer. Claims 1, 4, 5, 11-15, and 19-26 have been amended. No new matter has been added.

The rejection of Claims 1-11, 21, and 22 under 35 U.S.C §112, second paragraph, is respectfully traversed. Claim 3 has been canceled. Applicant has amended Claims 1, 4, 5, 11, 21, and 22. Claims 2 and 6-10 depend, directly or indirectly, from independent Claim 1. Accordingly, Applicant respectfully submits that Claims 1-11, 21, and 22 particularly point out and distinctly claim the subject matter which the Applicant regards as his invention. Hence, Applicant respectfully requests that the section 112 rejection to Claims 1-11, 21, and 22 be withdrawn.

The rejection of Claims 1-3, 8-15, 18-22, and 24-26 under 35 U.S.C. § 102(b) as being anticipated by Huang et al. (U.S. Patent No. 6,147,844) is respectfully traversed.

Huang et al. describe a quench protection circuit for persistent superconducting magnets for magnetic resonance imaging. The quench protection circuit includes a series of connected magnet coils (16 and 17) that are shunted by a plurality of heaters (31, 32, 33 and 34) with a plurality of diodes (35 and 36) connected in parallel in a reverse polarity connection with an emitter of each connected to a collector of the other (column 3, lines 26-30, Figure 2). A reverse polarity diode circuit (137) includes a plurality of diodes (138 and 139) connected in series with parallel heater circuit (31, 32, 33, 34) and across the magnet coils (column 4, lines 54-56, Figure 3).

Claim 1 recites a method of protecting an MR imaging magnet including a plurality of coil groups, the method comprising “connecting at least one first diode between terminals of a first coil group; connecting at least one second diode between terminals of a second coil group, wherein the second group is connected to the first coil group via a separation line; and connecting at least one quench heater with the

separation line and with the first and second diodes, wherein a voltage across the first coil group is equal to a sum of voltages across the at least one first diode and the at least one quench heater, and wherein an amount of current flowing through the at least one quench heater is different than an amount of current flowing through the at least one first diode.”

Huang et al. do not describe or suggest a method of protecting an MR imaging magnet as recited in Claim 1. Specifically, Huang et al. do not describe or suggest a voltage across the first coil group is equal to a sum of voltages across the at least one first diode and the at least one quench heater, and where an amount of current flowing through the at least one quench heater is different than an amount of current flowing through the at least one first diode. Rather, Huang et al. describe an MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel. The MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel is shown in Figure 2 of Huang et al. A reverse polarity diode circuit includes a plurality of diodes connected in series with the heaters and across the magnet coils as shown in Figure 3 of Huang et al. Accordingly, for the reasons set forth above, Claim 1 is submitted to be patentable over Huang et al.

Claim 3 has been canceled. Claims 2, 8-10, 24, and 26 depend from independent Claim 1. When the recitations of Claims 2, 8-10, 24, and 26 are considered in combination with the recitations of Claim 1, Applicant submits that Claims 2, 8-10, 24, and 26 likewise are patentable over Huang et al.

Claim 11 recites a method for adjusting energy input to a quench heater, the method comprising “connecting at least one diode in series with a dump resistor; and connecting a quench heater, the at least one diode, and the dump resistor in parallel with a coil group of a magnetic resonance imaging system, wherein a voltage across the coil group is equal to a sum of voltages across the quench heater, the at least one diode, and the dump resistor.”

Huang et al. do not describe or suggest a method for adjusting energy input to a quench heater as recited in Claim 11. Specifically, Huang et al. do not describe or

suggest connecting a quench heater, at least one diode, and a dump resistor in parallel with a coil group of a magnetic resonance imaging system, where a voltage across the coil group is equal to a sum of voltages across the quench heater, the at least one diode, and the dump resistor, and where the at least one diode is in series with the dump resistor. Rather, Huang et al. describe an MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel. The MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel is shown in Figure 2 of Huang et al. A reverse polarity diode circuit includes a plurality of diodes connected in series with the heaters and across the magnet coils as shown in Figure 3 of Huang et al. Accordingly, for the reasons set forth above, Claim 11 is submitted to be patentable over Huang et al.

Claim 12 recites a method for adjusting a current flowing through a coil quench heater, the method comprising “connecting at least one quench heater to a coil separation line separating a first coil group from a second coil group; connecting at least one shunt resistor or protecting diode in parallel to the quench heater to adjust the current flowing through the coil quench heater; and connecting a quench protection diode and the at least one quench heater in parallel with the first coil group, wherein a voltage across the first coil group is equal to a sum of voltages across the quench protection diode and the at least one quench heater, and wherein an amount of current flowing through the at least one quench heater is different than an amount of current flowing through the quench protection diode.”

Huang et al. do not describe or suggest a method for adjusting a current flowing through a coil quench heater as recited in Claim 12. Specifically, Huang et al. do not describe or suggest connecting a quench protection diode and the at least one quench heater in parallel with the first coil group, where a voltage across the first coil group is equal to a sum of voltages across the quench protection diode and the at least one quench heater, and where an amount of current flowing through the at least one quench heater is different than an amount of current flowing through the quench protection diode. Rather, Huang et al. describe an MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a

plurality of diodes connected in parallel. The MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel is shown in Figure 2 of Huang et al. A reverse polarity diode circuit includes a plurality of diodes connected in series with the heaters and across the magnet coils as shown in Figure 3 of Huang et al. Accordingly, for the reasons set forth above, Claim 12 is submitted to be patentable over Huang et al.

Claim 13 recites a quench protection circuit comprising “a first coil group; a second coil group; a coil separation line connecting said first group to said second group; a first quench heater connected to said coil separation line; and a first diode and said first quench heater are coupled in parallel with said first coil group, wherein a voltage across the first coil group is equal to a sum of voltages across the first diode and the first quench heater, and wherein an amount of current flowing through the first quench heater is different than an amount of current flowing through the first diode.”

Huang et al. do not describe or suggest a quench protection circuit as recited in Claim 13. Specifically, Huang et al. do not describe or suggest a first diode and the first quench heater are coupled in parallel with the first coil group, where a voltage across the first coil group is equal to a sum of voltages across the first diode and the first quench heater, and where an amount of current flowing through the first quench heater is different than an amount of current flowing through the first diode. Rather, Huang et al. describe an MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel. The MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel is shown in Figure 2 of Huang et al. A reverse polarity diode circuit includes a plurality of diodes connected in series with the heaters and across the magnet coils as shown in Figure 3 of Huang et al. Accordingly, for the reasons set forth above, Claim 13 is submitted to be patentable over Huang et al.

Claims 14, 15, and 18-22 depend, directly or indirectly, from independent Claim 13. When the recitations of Claims 14, 15, and 18-22 are considered in

combination with the recitations of Claim 13, Applicant submits that Claims 14, 15, and 18-22 likewise are patentable over Huang et al.

Claim 25 recites a method of protecting an MR imaging magnet including a plurality of coil groups including a first coil group and a second coil group, said method comprising “connecting a first diode with the first coil group; connecting the second coil group with the first coil group via a separation line; and connecting a quench heater with the separation line and with the first diode, wherein a voltage across the first coil group is equal to a sum of voltages across the first diode and the quench heater, and wherein an amount of current flowing through the quench heater is different than an amount of current flowing through the first diode, and wherein the first and second coil groups have substantially no unbalanced quench forces during quench events.”

Huang et al. do not describe or suggest a method of protecting an MR imaging magnet as recited in Claim 25. Specifically, Huang et al. do not describe or suggest a voltage across the first coil group is equal to a sum of voltages across the first diode and the quench heater, and where an amount of current flowing through the quench heater is different than an amount of current flowing through the first diode. Rather, Huang et al. describe an MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel. The MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel is shown in Figure 2 of Huang et al. A reverse polarity diode circuit includes a plurality of diodes connected in series with the heaters and across the magnet coils as shown in Figure 3 of Huang et al. Accordingly, for the reasons set forth above, Claim 25 is submitted to be patentable over Huang et al.

For at least the reasons set forth above, Applicant respectfully requests that the Section 102 rejection of Claims 1-3, 8-15, 18-22, and 24-26 be withdrawn.

The rejection of Claim 23 under 35 U.S.C. § 103(a) as being unpatentable over Huang et al. is respectfully traversed.

Huang et al. is described above.

Claim 23 recites a magnetic resonance imaging (MRI) system comprising “a radio frequency (RF) coil assembly for imaging a subject volume; a computer coupled to said RF coil, said computer configured to generate images of a scanned object; and a magnetic resonance imaging magnet having a quench protection circuit, said quench protection system comprising: a first coil group; a second coil group; a coil separation line connecting said first group to said second group; a first quench heater connected to said coil separation line; and a first diode and said first quench heater are coupled in parallel with said first coil group, wherein a voltage across the first coil group is equal to a sum of voltages across the first diode and the first quench heater, and wherein an amount of current flowing through the first quench heater is different than an amount of current flowing through the first diode.”

Huang et al. do not describe or suggest a magnetic resonance imaging (MRI) system as recited in Claim 23. Specifically, Huang et al. do not describe or suggest a first diode and the first quench heater are coupled in parallel with the first coil group, where a voltage across the first coil group is equal to a sum of voltages across the first diode and the first quench heater, and where an amount of current flowing through the first quench heater is different than an amount of current flowing through the first diode. Rather, Huang et al. describe an MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel. The MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel is shown in Figure 2 of Huang et al. A reverse polarity diode circuit includes a plurality of diodes connected in series with the heaters and across the magnet coils as shown in Figure 3 of Huang et al. Accordingly, for the reasons set forth above, Claim 23 is submitted to be patentable over Huang et al.

In addition to the arguments set forth above, Applicant respectfully submits that the Section 103 rejection of Claim 23 over Huang et al. alone is not a proper rejection. As is well established, the mere assertion that it would have been obvious to one of ordinary skill in the art to have modified Huang et al. to obtain the claimed recitations of the present invention does not support a *prima facie* obvious rejection. Rather, each allegation of what would have been an obvious matter of design choice must always be supported by citation to some reference work recognized as standard

in the pertinent art and the Applicant given the opportunity to challenge the correctness of the assertion or the notoriety or repute of the cited reference. Applicant has not been provided with the citation to any reference supporting the combination made in the rejection. The rejection, therefore, fails to provide the Applicant with a fair opportunity to respond to the rejection, and fails to provide the Applicant with the opportunity to challenge the correctness of the rejection. Of course, such combinations are impermissible, and for this reason alone, Applicant requests that the Section 103 rejection of Claim 23 be withdrawn.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claim 23 be withdrawn.

The rejection of Claims 4-7, 16, and 17 under 35 U.S.C. § 103(a) as being unpatentable over Huang et al. and further in view of Gross et al. (U.S. Patent 5,650,902) is respectfully traversed.

Huang et al. is described above.

Gross et al. describe a superconducting-magnet electrical circuit (12) (Figure 3). The superconducting-magnet electrical circuit includes a bipolar current-bypass electrical-circuit element (16). The bipolar current-bypass electrical-circuit element includes first and second diodes (46 and 48) opposingly coupled together in parallel (column 4, lines 40-44). The superconductive-magnet electrical circuit also contains a voltage-clamping device (54) (column 5, lines 27-28). The voltage-clamping device includes a resistor (56) having a first lead (58) and a second lead (60), where the first lead is coupled in parallel with second and third superconductive-coil portions (20 and 22) (column 5, lines 28-32).

Claims 4-7 depend, directly or indirectly, from independent Claim 1 which is recited above. Neither Huang et al. nor Gross et al., considered alone or in combination, describe or suggest a method of protecting an MR imaging magnet as recited in Claim 1. Specifically, neither Huang et al. nor Gross et al., considered alone or in combination, describe or suggest a voltage across the first coil group is equal to a sum of voltages across the at least one first diode and the at least one quench heater, and where an amount of current flowing through the at least one

quench heater is different than an amount of current flowing through the at least one first diode. Rather, Huang et al. describe an MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel. The MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel is shown in Figure 2 of Huang et al. A reverse polarity diode circuit includes a plurality of diodes connected in series with the heaters and across the magnet coils as shown in Figure 3 of Huang et al. Gross et al. describe a superconducting-magnet electrical circuit that includes a bipolar current-bypass electrical-circuit element. The bipolar current-bypass electrical-circuit element includes first and second diodes opposingly coupled together in parallel. The superconductive-magnet electrical circuit also contains a voltage-clamping device. The voltage-clamping device includes a resistor having a first lead and a second lead, where the first lead is coupled in parallel with second and third superconductive-coil portions. The superconducting-magnet electrical circuit is shown in Figure 3 of Gross et al. Accordingly, for the reasons set forth above, Claim 1 is submitted to be patentable over Huang et al. in view of Gross et al.

When the recitations of Claims 4-7 are considered in combination with the recitations of Claim 1, Applicant submits that dependent Claims 4-7 likewise are patentable over Huang et al. in view of Gross et al.

Claims 16 and 17 depend, directly or indirectly, from independent Claim 13 which is recited above. Neither Huang et al. nor Gross et al., considered alone or in combination, describe or suggest a quench protection circuit as recited in Claim 13. Specifically, neither Huang et al. nor Gross et al., considered alone or in combination, describe or suggest a first diode and the first quench heater are coupled in parallel with the first coil group, where a voltage across the first coil group is equal to a sum of voltages across the first diode and the first quench heater, and where an amount of current flowing through the first quench heater is different than an amount of current flowing through the first diode. Rather, Huang et al. describe an MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel. The MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters

with a plurality of diodes connected in parallel is shown in Figure 2 of Huang et al. A reverse polarity diode circuit includes a plurality of diodes connected in series with the heaters and across the magnet coils as shown in Figure 3 of Huang et al. Gross et al. describe a superconducting-magnet electrical circuit that includes a bipolar current-bypass electrical-circuit element. The bipolar current-bypass electrical-circuit element includes first and second diodes opposingly coupled together in parallel. The superconductive-magnet electrical circuit also contains a voltage-clamping device. The voltage-clamping device includes a resistor having a first lead and a second lead, where the first lead is coupled in parallel with second and third superconductive-coil portions. The superconducting-magnet electrical circuit is shown in Figure 3 of Gross et al. Accordingly, for the reasons set forth above, Claim 13 is submitted to be patentable over Huang et al. in view of Gross et al.

When the recitations of Claims 16 and 17 are considered in combination with the recitations of Claim 13, Applicant submits that dependent Claims 16 and 17 likewise are patentable over Huang et al. in view of Gross et al.

For at least the reasons set forth above, Applicant respectfully requests that the Section 103 rejection of Claims 4-7, 16, and 17 be withdrawn.

Moreover, Applicant respectfully submits that the Section 103 rejection of Claims 4-7, 16, and 17 is not a proper rejection. As is well established, obviousness cannot be established by combining the teachings of the cited art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination. Neither Huang et al. nor Gross et al., considered alone or in combination, describe or suggest the claimed combination. Furthermore, in contrast to the assertion within the Office Action, Applicant respectfully submits that it would not be obvious to one skilled in the art to combine Huang et al. with Gross et al. because there is no motivation to combine the references suggested in the cited art itself.

As the Federal Circuit has recognized, obviousness is not established merely by combining references having different individual elements of pending claims. Ex parte Levengood, 28 U.S.P.Q.2d 1300 (Bd. Pat. App. & Inter. 1993). MPEP 2143.01. Rather, there must be some suggestion, outside of Applicant's disclosure, in the prior

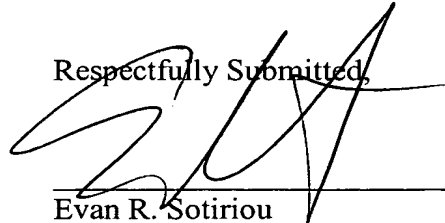
art to combine such references, and a reasonable expectation of success must be both found in the prior art, and not based on Applicant's disclosure. In re Vaeck, 20 U.S.P.Q.2d 1436 (Fed. Cir. 1991). In the present case, neither a suggestion or motivation to combine the prior art disclosures, nor any reasonable expectation of success has been shown.

Furthermore, it is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the cited art so that the claimed invention is rendered obvious. Specifically, one cannot use hindsight reconstruction to pick and choose among isolated disclosures in the art to deprecate the claimed invention. Further, it is impermissible to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. The present Section 103 rejection is based on a combination of teachings selected from multiple patents in an attempt to arrive at the claimed invention. Specifically, Huang et al. teach an MRI protection circuit including a series of connected magnet coils that are shunted by a plurality of heaters with a plurality of diodes connected in parallel. A reverse polarity diode circuit includes a plurality of diodes connected in series with the heaters and across the magnet coils. Gross et al. teach a superconducting-magnet electrical circuit that includes a bipolar current-bypass electrical-circuit element. The bipolar current-bypass electrical-circuit element includes first and second diodes opposingly coupled together in parallel. The superconductive-magnet electrical circuit also contains a voltage-clamping device. The voltage-clamping device includes a resistor having a first lead and a second lead, where the first lead is coupled in parallel with second and third superconductive-coil portions. Since there is no teaching nor suggestion in the cited art for the combination, the Section 103 rejection appears to be based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicant requests that the Section 103 rejections of Claims 4-7, 16, and 17 be withdrawn.

For at least the reasons set forth above, Applicant respectfully requests that the rejections of Claims 4-7, 16, and 17 under 35 U.S.C. 103(a) be withdrawn.

In view of the foregoing amendment and remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read 'E. Sotiriou', is written over a horizontal line.

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